U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION

HEARING CHARTER

Federal STEM Education Programs

Wednesday, June 6, 2007
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building

Purpose

The purpose of the hearing is to review the K-16 science, technology, engineering, and mathematics (STEM) education activities of federal agencies and to explore current efforts for the improvement of interagency coordination and evaluation of programs. In addition, agencies will be asked to respond to the witness testimonies given on May 15, 2007, about the educators' views on the STEM education programs at federal R&D mission agencies. The witnesses provided Subcommittee Members with their suggestions for how those agencies could best contribute to STEM education nationwide and strongly recommended closely collaborating with educators in the field when developing programs.

Witnesses

Dr. Cora Marrett, Assistant Director, Directorate for Education and Human Resources, National Science Foundation
Co-Chair, Education and Workforce Development Subcommittee, National Science and Technology Committee

Dr. Joyce Winterton, Assistant Administrator, Office of Education, National Aeronautics and Space Administration

Mr. William Valdez, Director, Office of Workforce Development for Teachers and Scientists, Office of Science, Department of Energy

Dr. Bruce Fuchs, Director, Office of Science Education, National Institutes of Health

Overarching Questions

- What steps have agencies taken to improve coordination with other federal agencies' STEM education activities and, in particular, what is the status of the new

coordinating committee under the National Science and Technology Committee (NSTC)? To what extent do agencies collaborate with educators in the states and school districts in developing STEM education programs?

- The recent report of the Academic Competitiveness Council reinforces the need for better evaluation and performance metrics for federal STEM education programs. What plans do agencies have to improve evaluation of STEM programs?

- The Subcommittee received testimony at a hearing on 15 May on how the R&D mission agencies could improve the effectiveness of their STEM education programs. The witnesses were skeptical of the ability of the R&D mission agencies to develop curricular materials for formal classroom instruction and questioned the effectiveness of their teacher professional development programs to improve teacher classroom performance, while suggesting that the agencies' most important role is in informal STEM education. The witnesses also strongly recommended closer collaboration by the agencies with educators in the field when developing STEM programs. What are agencies' responses to the recommendations from these witnesses?

- How do the agencies determine priorities for their K-16 STEM education portfolios? Has agencies' balance of programs at graduate/post doctoral, undergraduate, K-12, and informal education changed much over the past few years? Is there a likelihood of a change in that balance in the future?

- How do agencies disseminate information about STEM education programs? What organizations, both government and private, have agencies partnered with to reach educators in the field?

Background

STEM Education Funding

In an effort to identify the contributions of federal agencies to improving STEM education, the Academic Competitiveness Council (ACC) was created in the *Deficit Reduction Act of 2005* (P.L. 109-171) and charged with creating an inventory of STEM education programs across federal agencies, identifying the effectiveness of those programs, determining areas of overlap or duplication among programs, identifying target populations served by the programs, and recommending processes to integrate and coordinate those programs. After a yearlong study, the ACC released a report containing an inventory of $3.12 billion in funding for Fiscal Year (FY) 2006 for 105 STEM education programs. This inventory showed that nearly 50% of funding was directed toward Graduate/Post Doctoral programs ($1.4 billion) and another 30% was directed toward Undergraduate Programs ($943 million). K-12 programs received approximately $574 million in funding and informal education programs received $137 million in funding.

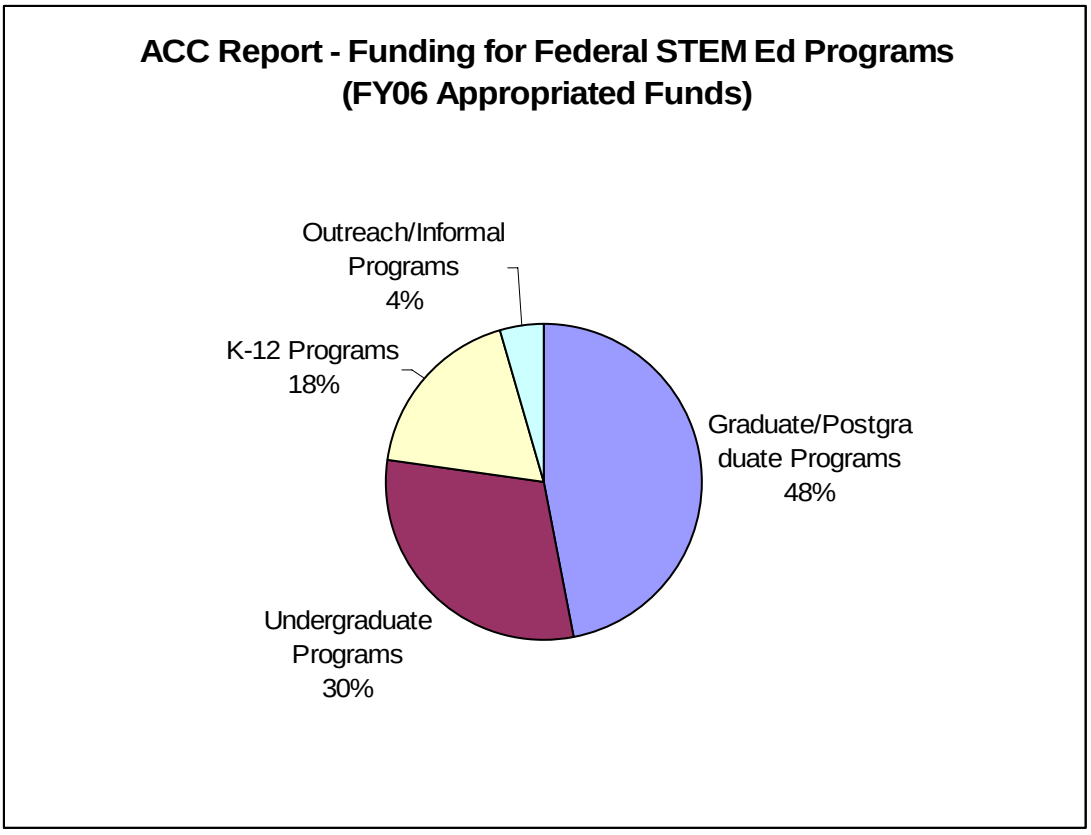


Figure 1 Source: ***Report of the Academic Competitiveness Council, May 2007***

The agencies under the jurisdiction of the Committee on Science and Technology showed a similar balance of funding for STEM education programs with about two-thirds of funding going to post-secondary programs. The National Institutes of Health, whose representative has been included as a witness in this hearing due to agency's large investment in STEM education, reported a total of $856 million in FY06 funding with 89% dedicated to the Kirschstein National Research Service Award for graduate/post doctoral fellowships ($761 million). NIH provided approximately $52 million for K-12 programs (6%), $37 million for undergraduate programs (4.4%), and $5 million for informal education programs (0.6%).

Table 1 FYO6 Appropriated Funds (in millions) for Agencies under the Jurisdiction of the Committee on Science and Technology

Agency	K-12	Undergraduate	Graduate/Post Doctoral	Informal	Totals
EPA	$0.00	$0.00	$11.06	$0.00	$11.06
Energy	$4.34	$2.28	$5.50	$0.00	$12.12
NASA	$23.00	$0.00	$105.40	$34.00	$162.40
NIST	$0.00	$0.42	$11.02	$0.00	$11.44
NOAA	$11.59	3.96	$14.65	$7.76	$37.96
NSF	$241.60	$351.35	$259.18	$71.60	$923.73
Totals	$280.53	$358.01	$406.81	$113.36	$1,158.71

Source: ***Report of the Academic Competitiveness Council,*** **May 2007**

The ACC set parameters of its inventory, limiting the programs for inclusion to those "primarily intended to provide support for, or to strengthen, science, technology, engineering, or mathematics education." The Subcommittee on Research and Science Education, realizing that many educational activities carried out by the federal R&D mission agencies are contained within larger programs, worked with those agencies to provide a more in-depth view of those efforts. Excluding graduate education programs which already dominate mission agencies' STEM funding, an additional $256.65 million in FY06 appropriated funds for K-12, undergraduate, and informal education activities was identified for a total of $1.01 billion in K-16 funding at NSF and the federal R&D mission agencies. (EPA reported no FY06 funding for K-16 STEM education activities.)

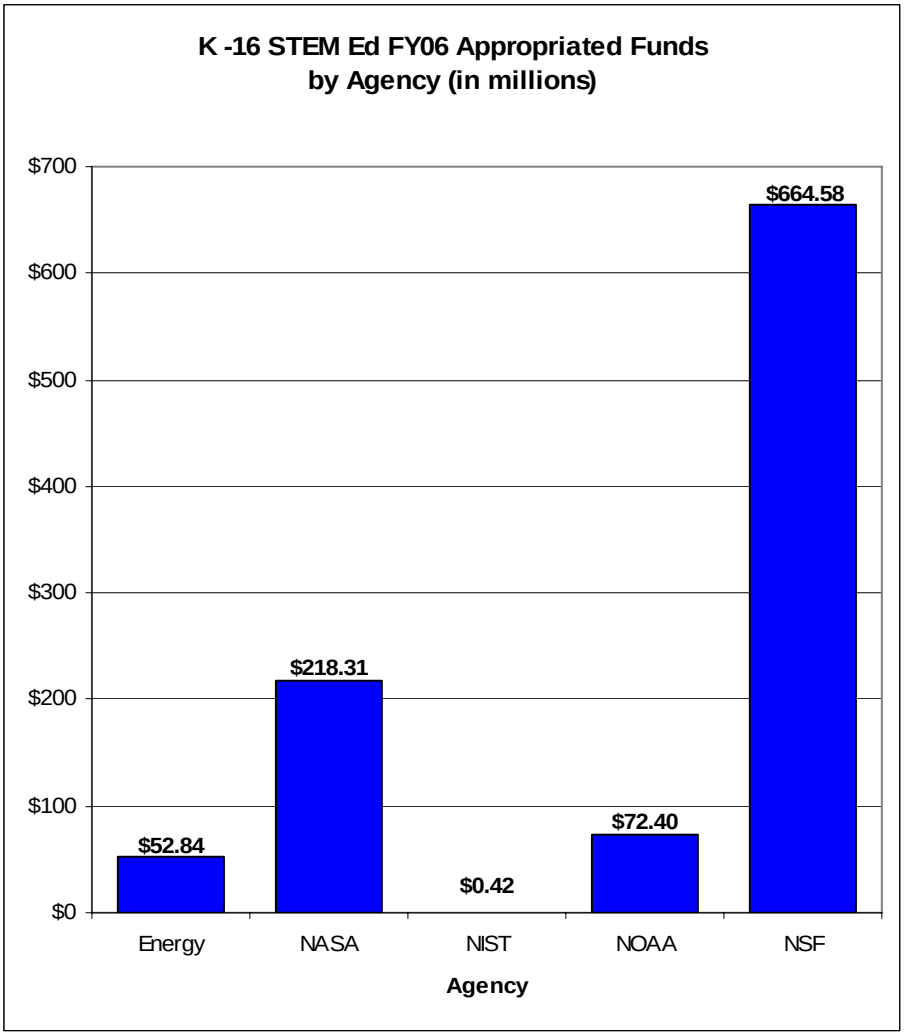
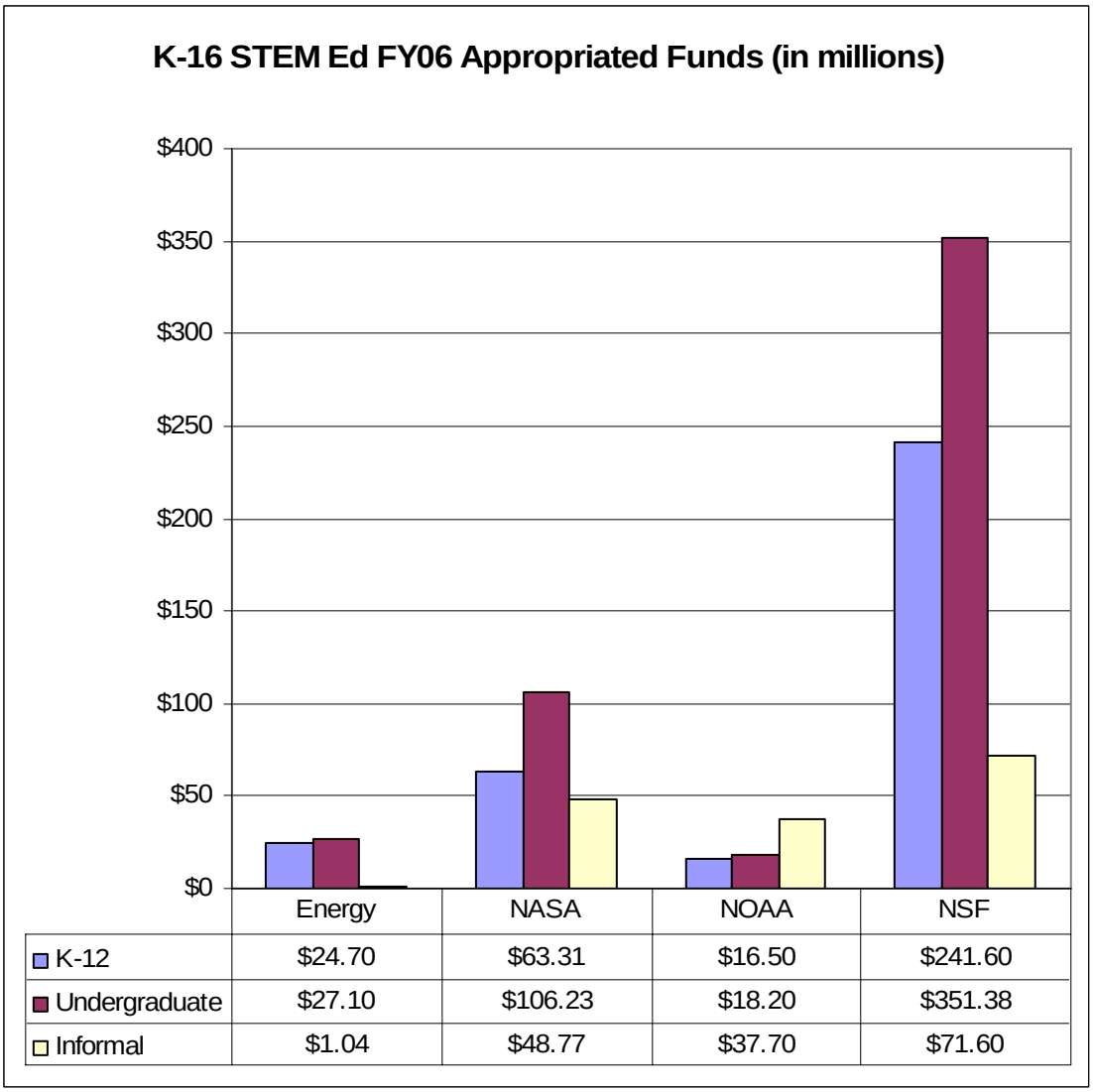


Figure 2 Source: Agency submissions compiled by the Committee on Science and Technology, Subcommittee on Research and Science Education

As can be seen in the table in Figure 3 *K-16 STEM Ed FY06 Appropriated Funds*, roughly an equal amount of funding is dedicated to undergraduate activities as K-12 and informal education activities combined.



	Energy	NASA	NOAA	NSF
K-12	$24.70	$63.31	$16.50	$241.60
Undergraduate	$27.10	$106.23	$18.20	$351.38
Informal	$1.04	$48.77	$37.70	$71.60

Figure 3 Source: Agency submissions compiled by the Committee on Science and Technology, Subcommittee on Research and Science Education

Evaluation of Programs

Another consistent criticism of federal STEM education programs is a lack of evaluation methods which would show the level of effectiveness of a program. The ACC studied evaluation processes used by the identified STEM education programs and concluded in its report that "there is a general dearth of evidence of effective practices and activities in STEM education." The ACC recommended that funding for any program should not be increased until it can show effectiveness as determined by rigorous evaluation methods. The report points to randomized control trials or, when that is not feasible, well-matched comparison group studies as the optimal methods for determining if a program is effective.

This sentiment was echoed by the witnesses at the Subcommittee's hearing on May 15, 2007, *Federal STEM Education Programs: Educators' Perspectives* who explained to Members that the absence of consistent performance measurements makes choosing

among the vast array of programs difficult and time-consuming. Although all of the witnesses agreed that evaluations should be improved, two stated that they did not think that research methodologies such as randomized controlled trials would be practical or necessary for the majority of programs. Instead, they recommended that programs focus on developing design critiques of proposed programs and formative evaluations of current programs to guide decisions for building highly effective programs.

Coordination and Collaboration

The federal agencies have also been criticized for their lack of coordination and collaboration between agencies and with state and district education agencies when developing programs. All of the witnesses in the May 15th hearing agreed strongly with the need for more effort by the federal agencies to work with educators in the field. The Mathematics and Science Director of Chicago Public Schools explained that materials and programs developed by federal agencies that do not fit into the district's curriculum and the state standards only add confusion and distract from the successful program they have built. The Director of Science, Technology, and Mathematics at Western Washington University commented, "There is huge inventory of poorly-designed and under-evaluated mission-related curricula, posters, and lesson plans and associated professional development rarely used in classrooms and with no natural home in a coherent standards-based curriculum. The constant barrage of new resources adds to the noise in the system and contributes to the mile-wide, inch-deep problem."

In response to this issue, the ACC recommended that the National Science and Technology Committee (NSTC), which serves as the principal body for coordinating federal research and development, re-establish the Education and Workforce Development subcommittee to encourage the agencies to share knowledge and develop a federal strategic plan for effectively increasing STEM proficiency nationwide. The NSTC recently announced the subcommittee will be co-chaired by NSF, the Department of Education, and the National Institutes of Health. Dr. Cora Marrett, as the co-chair from NSF, has been asked to provide an update on the status of the NSTC subcommittee in this hearing.

Specific Questions for the Witnesses

Dr. Marrett

- As co-chair of the NSTC Subcommittee on Education and Workforce Development, please describe the make up of the group, current activities, and planned activities.

- What steps has your agency taken to improve its coordination with other federal agencies' STEM education activities? How has your agency improved its collaboration with states and districts in developing STEM education programs? Please describe your agency's commitment to establishing formal mechanisms to improve in these areas.

- The ACC report reinforces the need for better evaluation and performance metrics for federal STEM education programs. How has your agency made improvements in its evaluation of programs? How has this affected your agency's funding for STEM education programs?

- How does your agency determine priorities for its K-16 STEM education portfolio? Has your agency's balance of programs at graduate/post doctoral, undergraduate, K-12, and informal education changed? Do you foresee a change in that balance in the future?

- How does your agency disseminate information about its STEM education programs? What organizations, both government and private, have you partnered with to reach educators in the field?

Dr. Joyce Winterton

- What steps has your agency taken to improve its coordination with other federal agencies' STEM education activities? To what extent does your agency collaborate with educators in the states and school districts in developing STEM education programs?

- The recent report of the Academic Competitiveness Council reinforces the need for better evaluation and performance metrics for federal STEM education programs. What plans does your agency have for improvements in its evaluation of its STEM programs?

- The Subcommittee received testimony at a hearing on 15 May on how the R&D mission agencies could improve the effectiveness of their STEM education programs. (Witness statements and video of the hearing can be downloaded at http://www.science.house.gov/publications/hearings_markups_details.aspx?NewsID=1814). The witnesses were skeptical of the ability of the agencies to develop curricular materials for formal classroom instruction and questioned the effectiveness of their teacher professional development programs to improve teacher classroom performance, while suggesting that the agencies' most important role is in informal STEM education. The witnesses also strongly recommended closer collaboration by the agencies with educators in the field when developing STEM programs. What is your response to the recommendations from these witnesses?

- How does your agency determine priorities for its K-16 STEM education portfolio? Has your agency's balance of programs at graduate/post doctoral, undergraduate, K-12, and informal education changed much over the past few years? Do you foresee a change in that balance in the future?

- How does your agency disseminate information about its STEM education programs? What organizations, both government and private, have you partnered with to reach educators in the field?

Mr. William Valdez

- What steps has your agency taken to improve its coordination with other federal agencies' STEM education activities? How has your agency improved its collaboration with states and districts in developing STEM education programs? Please describe your agency's commitment to improving in these areas.

- The ACC report reinforces the need for better evaluation and performance metrics for federal STEM education programs. How has your agency made improvements in its evaluation of programs? How has this affected your agency's funding for STEM education programs?

- In response to the testimonies given on May 15th by STEM educators, what do you recommend as the most effective role your agency can play in improving STEM literacy?

- How does your agency determine priorities for its K-16 STEM education portfolio? Has your agency's balance of programs at graduate/post doctoral, undergraduate, K-12, and informal education changed? Do you foresee a change in that balance in the future?

- How does your agency disseminate information about its STEM education programs? What organizations, both government and private, have you partnered with to reach educators in the field?

- Please describe the process you utilized to gather information for creating a strategic plan for the OWDTS education programs. Include a synopsis of the information gathered.

Dr. Bruce Fuchs

- What steps has your agency taken to improve its coordination with other federal agencies' STEM education activities? To what extent does your agency collaborate with educators in the states and school districts in developing STEM education programs?

- The recent report of the Academic Competitiveness Council reinforces the need for better evaluation and performance metrics for federal STEM education programs. What plans does your agency have for improvements in its evaluation of its STEM programs?

- The Subcommittee received testimony at a hearing on 15 May on how the R&D mission agencies could improve the effectiveness of their STEM education programs. (Witness statements and video of the hearing can be downloaded at http://www.science.house.gov/publications/hearings_markups_details.aspx?NewsID=1814). The witnesses were skeptical of the ability of the agencies to develop curricular materials for formal classroom instruction and questioned the effectiveness of their teacher professional development programs to improve teacher classroom performance, while suggesting that the agencies' most important role is in informal STEM education. The witnesses also strongly recommended closer collaboration by the agencies with educators in the field when developing STEM programs. What is your response to the recommendations from these witnesses?

- How does your agency determine priorities for its K-16 STEM education portfolio? Has your agency's balance of programs at graduate/post doctoral, undergraduate, K-12, and informal education changed much over the past few years? Do you foresee a change in that balance in the future?

- How does your agency disseminate information about its STEM education programs? What organizations, both government and private, have you partnered with to reach educators in the field?